

F. W. R. A.

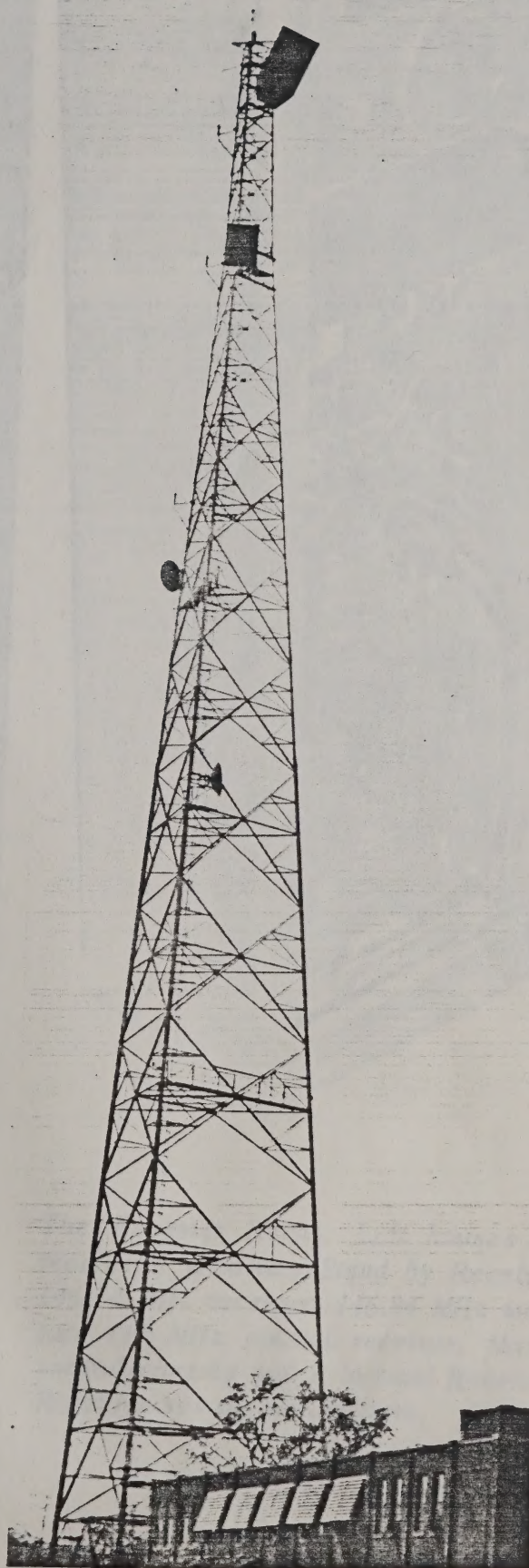
or ANOTHER REPEATER STORY

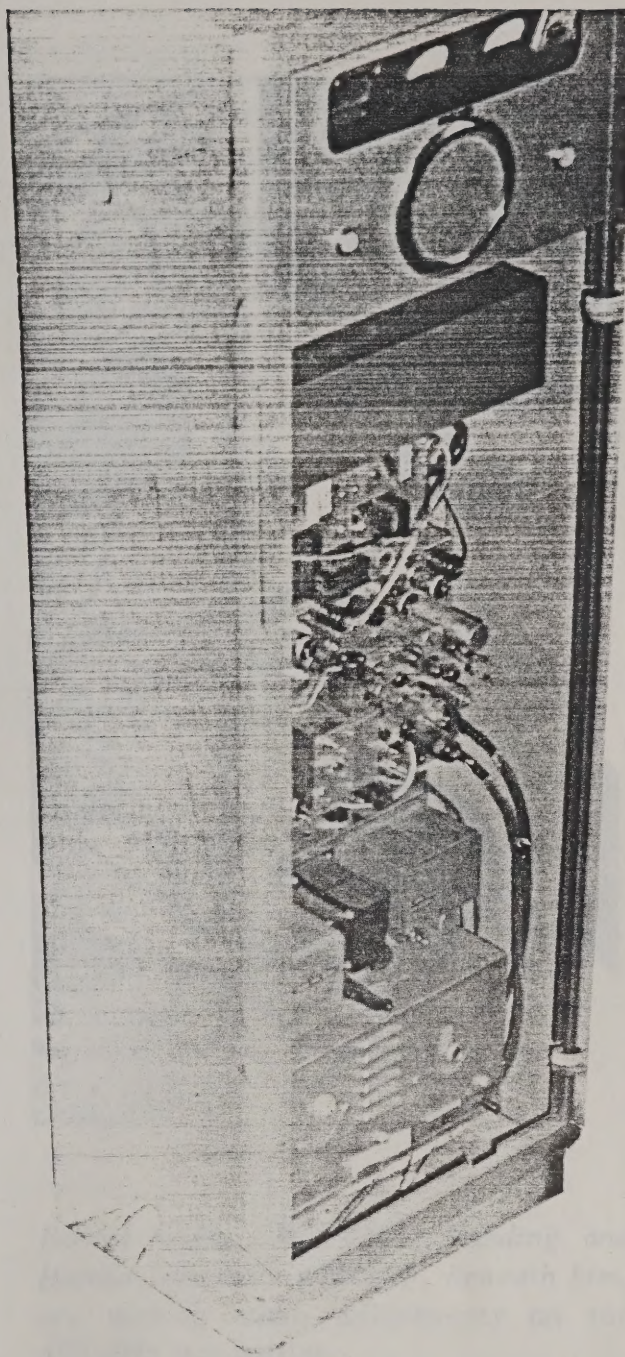
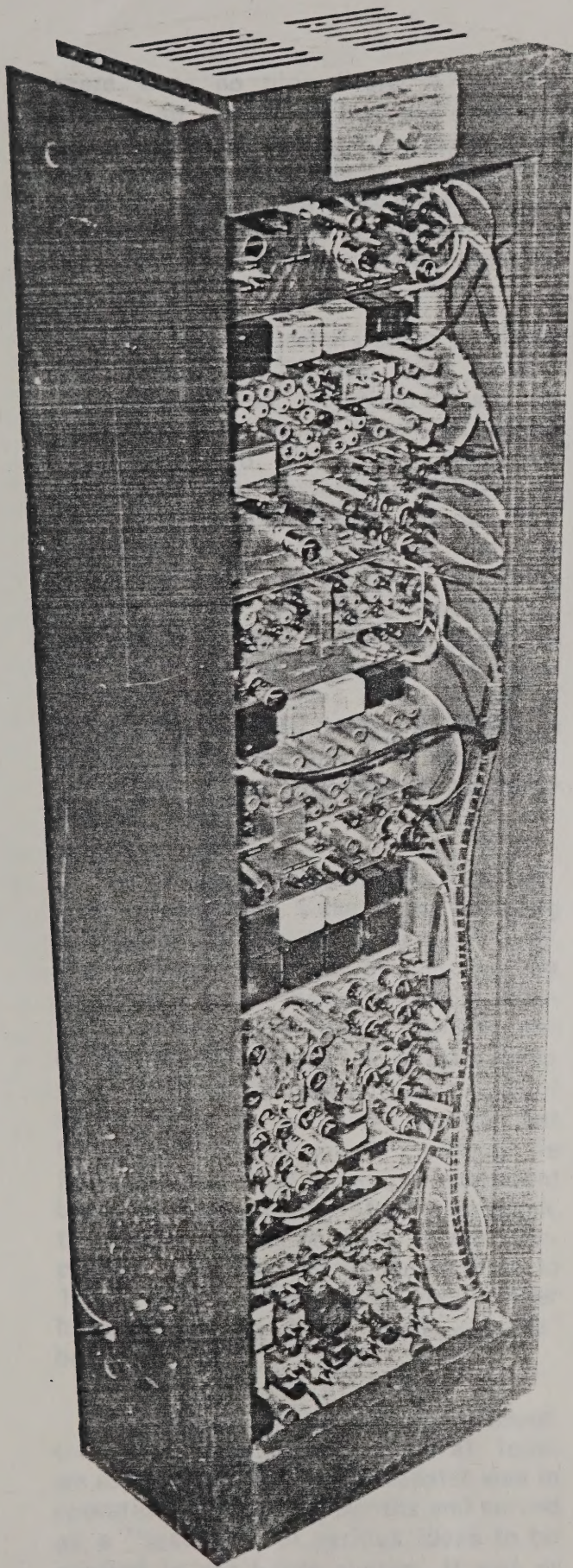
Roger Parkerson, K9OET

Perhaps this article should have used the title of the article which appeared in the March issue of **FM** about the Detroit repeater and said, "Indiana's First Repeater". Certainly, this is Indiana's first legal repeater and probably the original Ft. Wayne repeater, that was in operation nine years ago, was Indiana's first — legal or otherwise.

F.W.R.A. (Ft. Wayne Repeater Association) and the Ft. Wayne repeater got their legal start when the Articles of Incorporation were approved on August 23, 1968. But as I said, this whole thing really got started in 1960. It was at that time that three amateurs, besides myself, decided that FM was nice, but how much nicer it would be to extend our mobile range in some fashion. Unfortunately,

View of the 300 ft. tower on the property of the Indiana & Michigan Electric Co. The ground plane on the top is their antenna. The three side mounted antennas are ours; Receiver on top, 450 MHz center and the bottom antenna is the transmit stick.





The Repeater Racks. Left houses the receivers: Auxiliary Stand by Receiver, 146.34 MHz receiver, 146.94 MHz monitor, 440 MHz control receiver, Master control chassis and A lo-band Receiver. Right houses the transmitters.

there were no nice "How - to" FM articles so, after much trial and error, we had a 2 to 6-meter cross band repeater in operation from my house on a "When I'm at home" basis. We were still in high school at the time so resources, rather than technical considerations, dictated our operation.

The repeater consisted of a 146.94 MHz receiver, COR and 3OD 6-meter transmitter. Also incorporated was an automatic dial phone patch, of which little was said. The system performed quite well, all factors considered. In fact, it performed so well that we drew the usual round of criticism from the "old timers" on the frequency. But being young, and not knowing any better, we just said that after 5 years or so on FM, they were just mad because we did something that they hadn't even thought of doing. This repeater stayed in operation about a year and a half until we all finished high school and went on our merry ways.

Five years later, having returned home after school, some of the old gang was back along with a few new faces. The "gang" consisted of Ken Banning, K9RSF; Bob Cobb, WA9LHP; Harold Johnson, WA9MEF; Bill Trulock, K9RKA, and myself, K9OET. I had not wasted those years at Purdue because I had a ream of schematics on an "ultimate" repeater that I was just dying to see in operation. We formed into a loose group and equipment began to take shape. After much work, the second generation repeater was completed. This one, and in-band 146.34 to 146.76 system, was operated from another ham's house on a "When he was at home" basis.

By using .34 and .76, we relieved the .94 simplex congestion or at least we did not add to it. This repeater was in operation for about six months and served as a "test rig" for various ideas to be applied in our future system. It was at

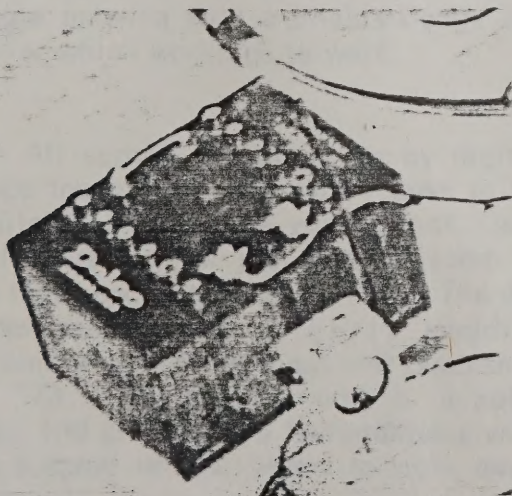


Robert Cobb - WA9LHP, Standing and Harold Johnson - WA9MEF, beneath him, are making audio adjustments on the 450 MHz transmitter.

this time that I was offered the job of C. D. Radio Officer; and we as a group decided Civil Defense and the repeater could mutually aid each other. This thing was now beginning to grow and it was decided to incorporate as a non-profit corporation to facilitate all aspects of the operation. With the aid of my cousin, who was an attorney, a corporate charter was issued.

With this in hand, we set about applying for a repeater license. We followed W3DTN's suggestions in the July issue of FM and the license application was submitted in September 1968. The location applied for was the tower of Indiana & Michigan Electric Co. They were very C.D. minded and permitted us to install our antennas on their 300 foot tower. Further, they supplied us with a room in the elevator penthouse and wired us into their emergency stand-by generator to insure continuous operation. Other local industries were contacted and certain items were obtained. Phelps-Dodge, who has a large copper wire plant here, also makes coax and after talking to several different persons, they gave us 1000 feet of 7/8 inch rubber jacketed Foamflex along with all the required connectors! To facilitate our logging requirements, Magnavox, another large local industry, gave us a 24 hour type logging recorder.

The Association supplied all of the equipment and Civil Defense bought and installed the antennas. At the top of the tower is our receiving antenna, a 6 db gain Phelps-Dodge station-master, 200-509. Twenty feet down is an 8 gain db Phelps-Dodge 450 MHz antenna. Seventy feet down from the top is another 6 db gain 2-meter antenna for the transmitter. All antennas are fed with the 7/8 inch coax. Our biggest fear, desensitization,



Ken Branning - K9RSF, shown adjusting the hi-band exciter.

proved to be groundless as we have none! With either our 30 watt exciter or 250 watt final in operation in the rack next to the receiver, absolutely no limiter deflection is noted, either up or down. Further when receiving a marginal signal, no difference is noted in quieting when the repeater transmitter is disabled. It is interesting to note that a cavity filter we had purchased for the anticipated problems was never even used.

On December 30, 1968, only 4 months later, our remote control license for the 5 control points arrived. WA9EAU repeater was put on the air January 1, 1969 — What a way to start the New Year!!! The actual system is contained in two racks, one Motorola six foot rack, and an old Link seven foot rack. In addition, there is the logging recorder and final amplifier power supply cabinets. A G.E. Progress

The batteries supply the 24 volt relays.



Kim Breeding - KXRS, shows adjusting the hi-band antenna.

ground to the groundless as we have none. With either our 30 watt radio or 500 watt fixed in position in the rack room to the receiver, absolutely no further distinction is noted either up or down. Further when receiving a signal, all tones, no difference is noted in listening when the transmitter is located. It is interesting to note that a cavity filter was had purchased for the mid-band problem was never even used.

On December 30, 1968, only 4 months later, our remote control license for the 2 control points arrived. WABEAD, operated was put on the air January 1, 1969. - What a way to start the New Year!! The actual system is contained in two racks - one Motorola six foot rack, and an old Link seven foot rack. In addition, there is the logic network and final amplifier power supply cabinets. A G.E. rugged

The batteries supply the 24 volt relay.

With this in hand, we set about applying for a repeater license. We let Edward Wooten's suggestions in the July issue of FM and the license application was submitted in September 1968. The location sought for was the tower of Indiana & Michigan Electric Co. They were very C.D. minded and permitted us to install our antennas on their 300 foot tower. Further, they supplied us with a room in the elevator penthouse and wired us into their emergency stand-by generator to insure continuous operation. Other local industries were contacted and certain items were obtained. Phelps-Dodge, who has a large copper wire plant here, who makes coax and after talking to several different sources, they gave us 1000 feet of 1/2 inch rubber jacketed Plexiglas along with all the required connectors. To facilitate the logging electronically, Malmgren, another large local industry, gave us a 54 hour type logging recorder.

The Association supplied all of the equipment and Civil Defense bought and installed the antennas. At the top of the tower is our receiving antenna, a 5 db gain Phelps-Dodge station-master 20-500. Twenty feet down is an 8 gain db Phelps-Dodge 450 MHz antenna. Seventy feet down from the top is another 5 db gain booster antenna for the transmitted. All antennas are fed with the 1/2 inch coax. Our biggest test, demonstration





The author, Roger Parkerson - K9OET, with Bill Trulock - K9RKA, looking on, dials up a control function.

Line 30 Watt strip operates either directly into a Motorola $\frac{1}{4}$ KW. The power level is tone switchable by any of the licensed control stations. UHF control equipment consists of a Motorola T44A6A system. The UHF system also functions as a repeater with 2-meters being repeated out on the 440 control channel for additional control purposes. The T44 drives a pair of 4CX250B's in another Motorola $\frac{1}{4}$ KW. The transmitters have a two minute time-out timer to limit incoming transmissions and prevent receiver lock-up or, perish the thought, a malfunction! 450 uses a single antenna with a Phelps-Dodge duplexer which works quite well.

All control functions are by digital since touch-tone dials don't seem to be available in this area yet. In fact, General Telephone is just getting some of the local exchanges set up for it. The decoder circuit is a slightly modified version of a RTTY terminal unit published in "73". The terminal unit is a solid state and aside from a few problems with the stepper relays, seems to work quite

well. The audio circuitry taps off from the receiver discriminator through a 12AU7 amplifier, cathode follower into the respective transmitters. Since the demise of our code wheel, we are now finishing and I.C. identifier as described in FM.

Well, that about sums up the Ft. Wayne Repeater Association, Inc., and the Ft. Wayne repeater. Right now we're talking about remoting some additional outlying receivers for better coverage for the low-power H. T. fellows. There is no problem hearing 250 watts but the incoming 1 or 2 watts becomes unreliable after 20 or 25 miles; additional receivers linked on 450 should take care of that. We would like to find some information on receiver voting selection. Also, we're talking about linking with some of the other repeaters. We've got a couple of ideas that we're pursuing and hope to have more information later. Presently, however, we're satisfied with about 40 to 50 miles mobile coverage with base stations as far away as Indianapolis, (130 miles) working in with a good degree of consistency.



The author, Roger Pearson, RIGHT, with Bill Tinsley, KARRA, looking at the author's mobile phone.

Well, the audio circuitry takes off from the receiver discriminator through a 12AU6 amplifier, cathode follower into the active resonant circuit. Since the device of our code wheel, we are now finishing and I.C. identifier as described in FM.

Well, that about sums up the FT Wayne Receiver Association, Inc. and the FT Wayne receiver. Right now we are talking about receiving some additional output receivers for better coverage for the low-power H.T. follow. There is no problem hearing 350 watts but the low coming 1 or 2 watts because of the loss after 20 or 25 miles additional here was linked on 450 about 1000 ft. that. We would like to find some information on receiver using selection. And, we're talking about talking with some of the other receivers. We've got a couple of ideas that we're working and hope to have some information later. Presently, however, we're satisfied with about 40 to 50 miles mobile coverage with base stations as far away as Indianapolis (150 miles) working in with a good degree of consistency.

The 30 Watt strip is used with directly into a Motorola 4KW. The power level is tone switchable by one of the licensed control stations. LHF control equipment consists of a Motorola TAA5A system. The LHF system also functions as a receiver with 2 meters being received out on the 450 control channel for additional control purposes. The TAA drives a pair of 4CX100B's in another Motorola 4KW. The transmitter has a two minute time-out timer to limit incoming transmissions and prevent receiver lock-up or, which the brought a malfunction. 450 uses a single antenna with a Phase-Change device which works quite well.

All control functions are by digital since touch-tone dialing seems to be available in this area and, but Gen-eral Telephone is not getting some of the local exchanges set up for the digital control. It is a digital modified version of a VTY terminal and installed in 1973. The terminal only is a solid state and still has a few problems with the station relay. Seems to work quite